

# Cheatgrass Control Strategies



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# Other Exotic Annual Grasses of Concern



North Africa Grass  
(*Ventenata dubia*)

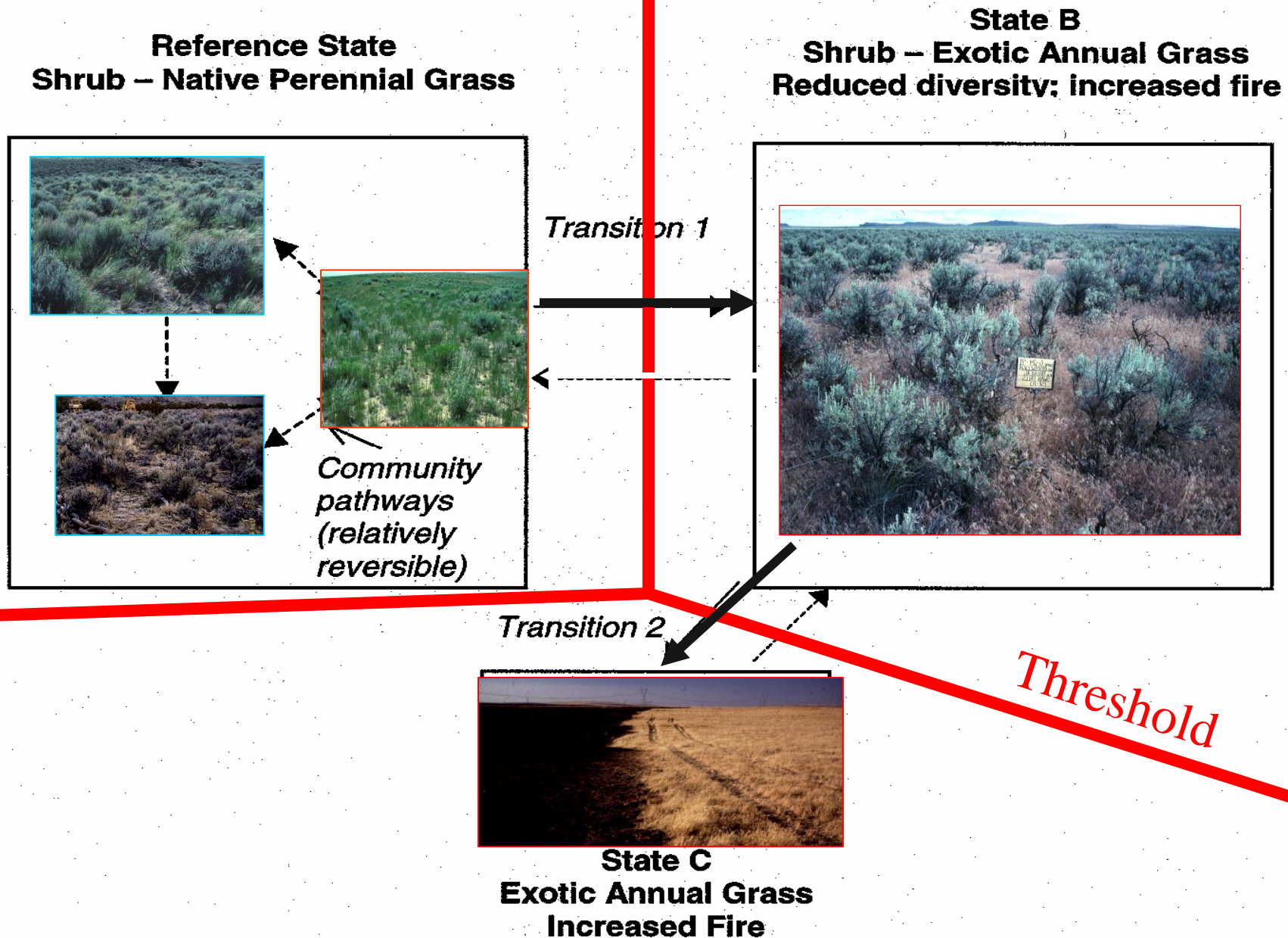




# The Cheatgrass-Wildfire Cycle

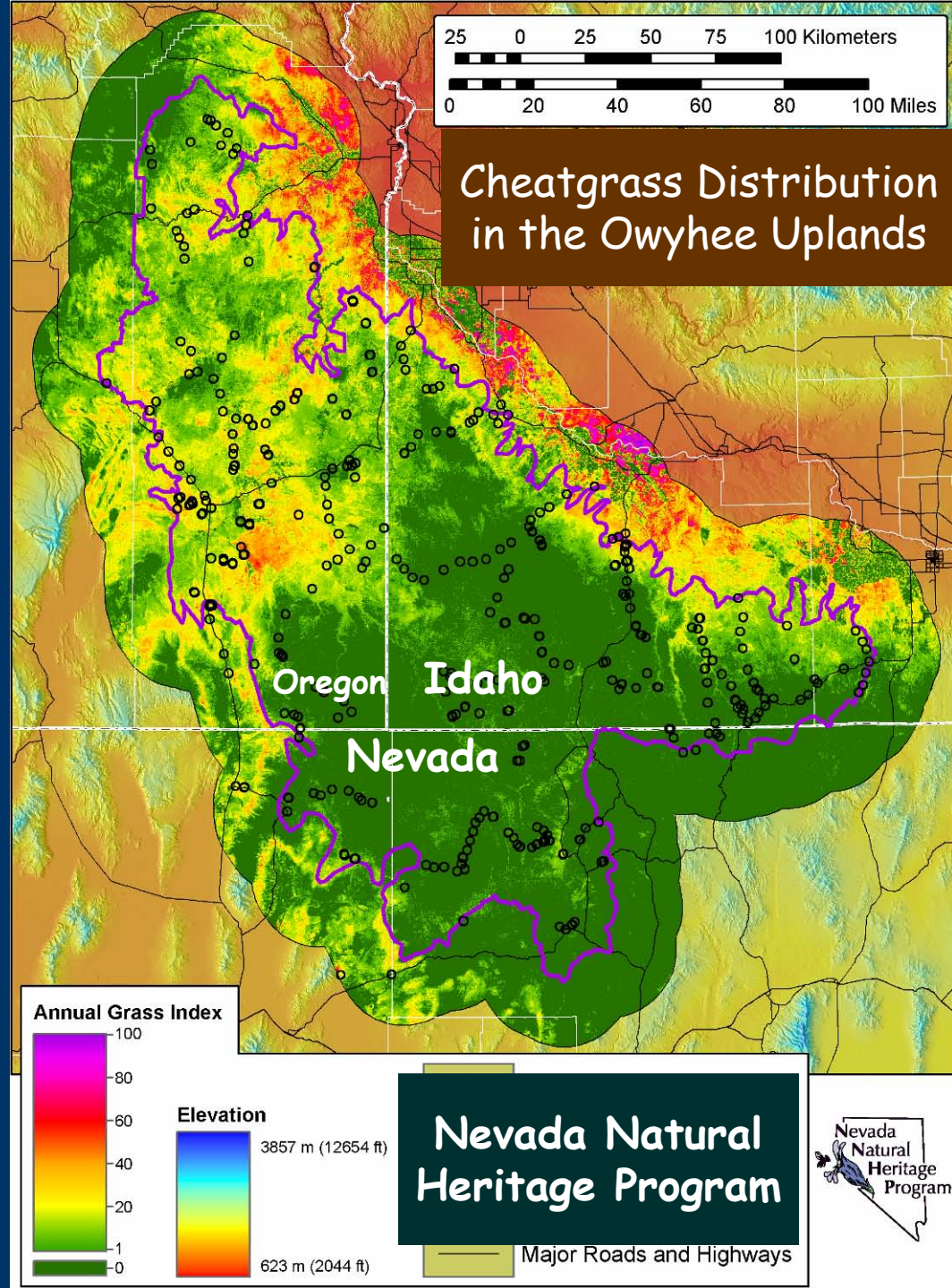


# What Level of Restoration is Required?





At a landscape scale, where and to what degree is cheatgrass a problem and where should strategic restoration treatments be implemented?



# Characteristics of Cheatgrass

- Germinates in fall or spring.
- Requires depressions or litter cover to germinate.
- Plant densities may exceed 13,000 plants/m<sup>2</sup> with 17,000 seeds/m<sup>2</sup>.
- Cures earlier than native plants...longer fire season.

Cheatgrass in rangeland drill rows



Cheatgrass in mid-June





# Cheatgrass Control Strategies



Seeding



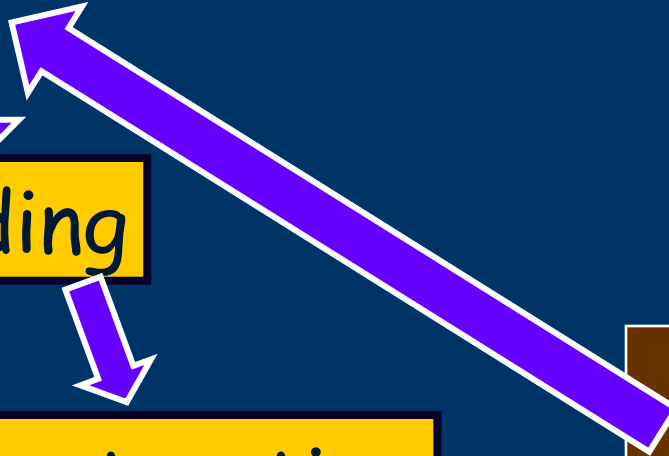
Green-strips



Restoration



No Seeding



1. Biological
2. Mechanical
3. Prescribed Fire
4. Herbicides

# Biological Control



From Big Animals....



....To Little Microbes



# Biological Control- Livestock



## Variables:

- Season of use
- Intensity of use
- Distribution
- Duration of use
- Class of livestock

In order to reduce fuels on rangelands you must repeat targeted grazing practices over a multi-year period under different climatic conditions over a large, diverse landscape.

# Biological Control- Livestock

June, 1990



Variable Annual  
Production of  
Cheatgrass

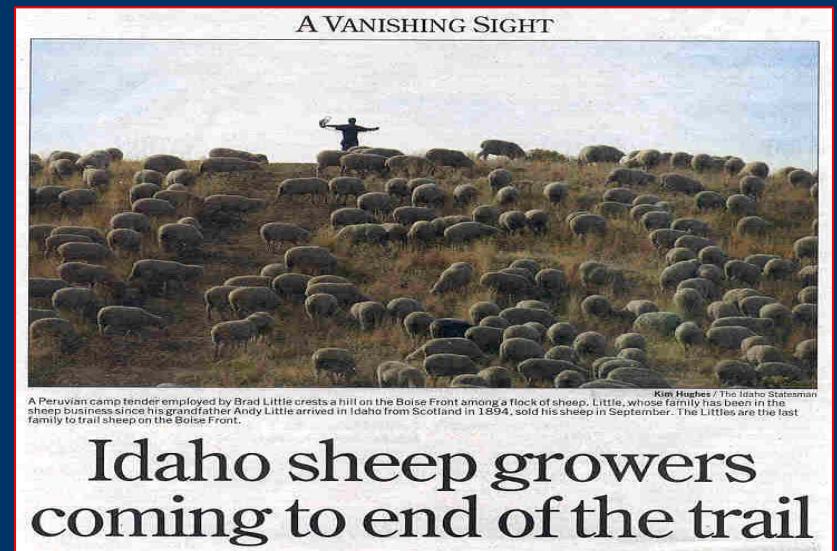
June, 1995



Hull and Pehanec (1947):  
Cheatgrass production in:  
Wet year--3,461 lbs/ac  
Dry year-- 361 lbs/ac

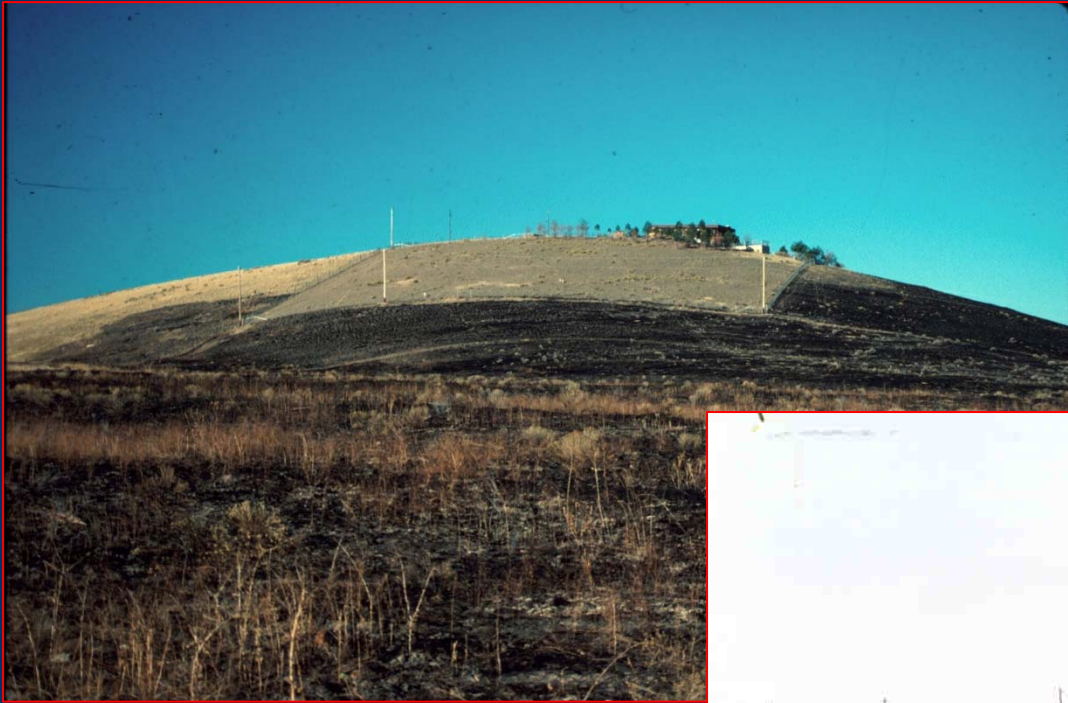


# Biological Control- Livestock Considerations





# Biological Control- Livestock Considerations

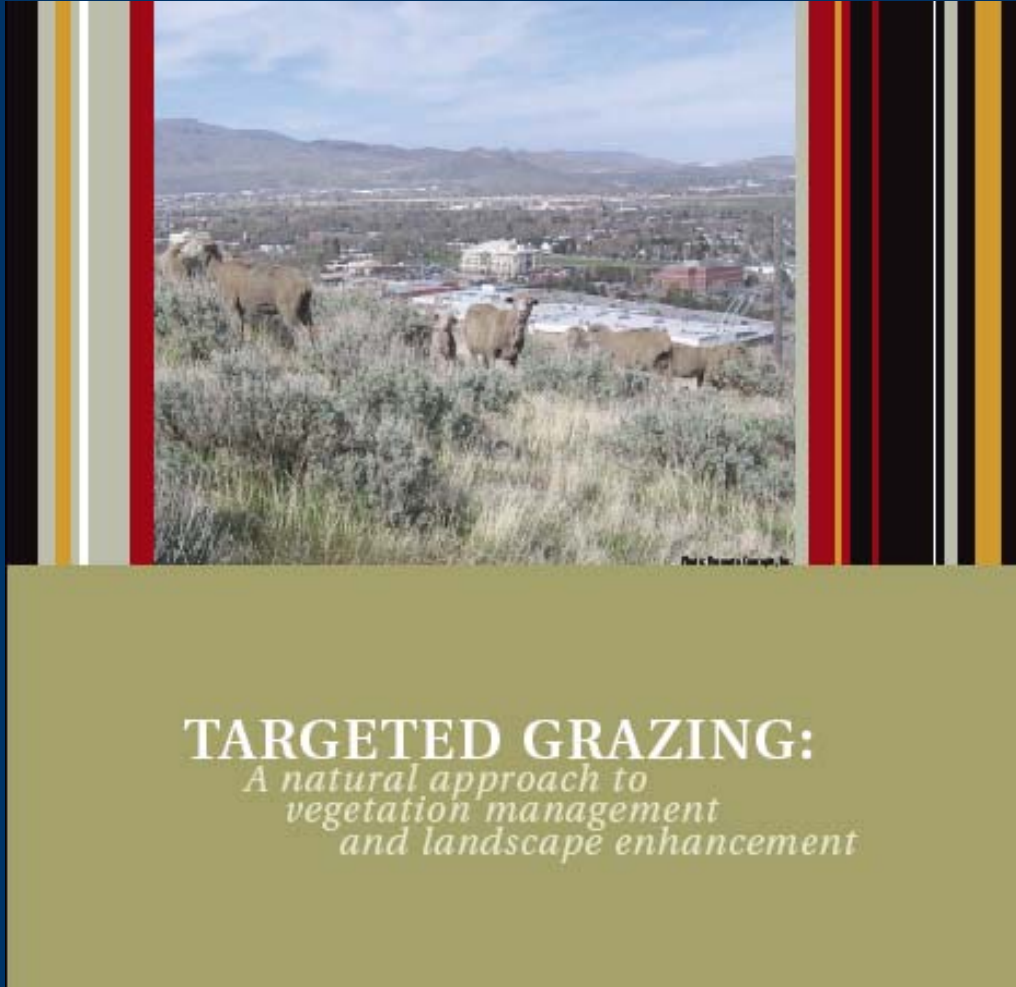


Secondary  
Impacts from  
Livestock Use





# Livestock as a Tool to Manage Weeds



## CHAPTER 8: Targeted Livestock Grazing to Suppress Invasive Annual Grasses

<http://www.cnr.uidaho.edu/rx-grazing/Handbook.htm>

# Biological Control- Livestock

## "Prescriptive Grazing"



Sheep Use- Carson City, NV



Sheep/Goat Use- Kuna, NV



# Murphy Complex Fire: Fuels/Livestock/Fire Relationships



In cooperation with the Murphy Wildland Fire Grazing and Fuel Assessment Team

**Interactions Among Livestock Grazing, Vegetation Type, and  
Fire Behavior in the Murphy Wildland Fire Complex in Idaho  
and Nevada, July 2007**

Open-File Report 2008–1214

U.S. Department of the Interior  
U.S. Geological Survey



# Biological Control

## "Black Fingers of Death"



- Fungus attacks seeds on the ground of many grass species, including cheatgrass-- not host-specific.
- Often kills a large fraction of cheatgrass seeds in the spring seed bank.

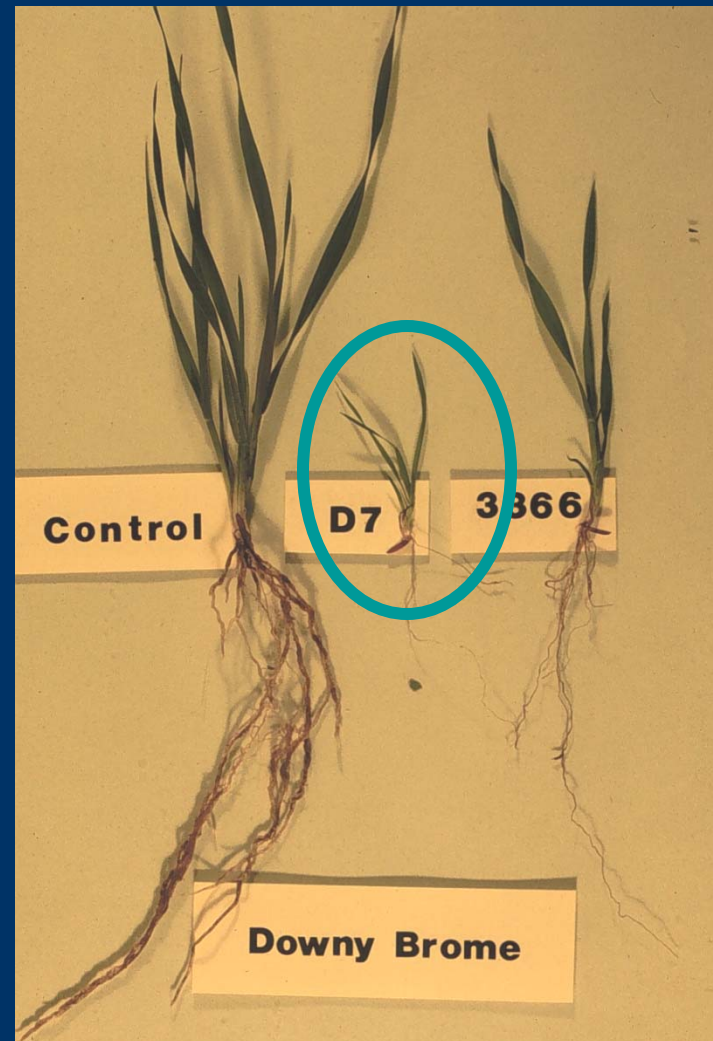




# Native Soil Rhizobacteria

## *Pseudomonas fluorescens* strain D7

- *Mode of Action: Bacterial exudates that produce root suppression activity against cheatgrass, jointed goatgrass and medusahead wildrye.*
- *Northwest Agricultural Products, Pasco, WA*



# Hanford, WA Rhizobacteria Field Trial

June 2002

Cheatgrass:  $1,875/\text{m}^2$

Native scurfpea:  $0.2/\text{m}^2$





# Hanford, WA Rhizobacteria Field Trial

June 2002

Cheatgrass: Trace

Native scurfpea: 19/m<sup>2</sup>





# Mechanical Cheatgrass Control



Fuelbreaks

Mountain Home Air Force  
Base Training Range



Highway 51--Grasmere, ID



# Mechanical- Disk Plow for Cheatgrass Control



Proper treatment timing is essential to reduce future cheatgrass!

Cheatgrass control requires seed to be buried 2-3 inches (Hulbert 1955) or live plants to be disked or plowed before cheatgrass turns "purple"





# Mechanical Control- Disks and Plows

## Be Careful!





# Prescribed Fire to Control Cheatgrass

- Relatively inexpensive with variable results.
- Must carefully consider risk of fire escape.

- Not slope/soils limited.
- No soil disturbance but fire stimulates some invasive plants.



# Prescribed Fire to Reduce Cheatgrass

**Table 1. Effects of burn dates on density of two weedy species.**



<u>Treatment</u>	<u>Density (plants/m<sup>2</sup>)</u>	
	<u>Cheatgrass</u>	<u>B. Buttercup</u>
June Burn	139a	273d
June Control	990b	50e
August Burn	234c	268d
August Control	1,165b	52e

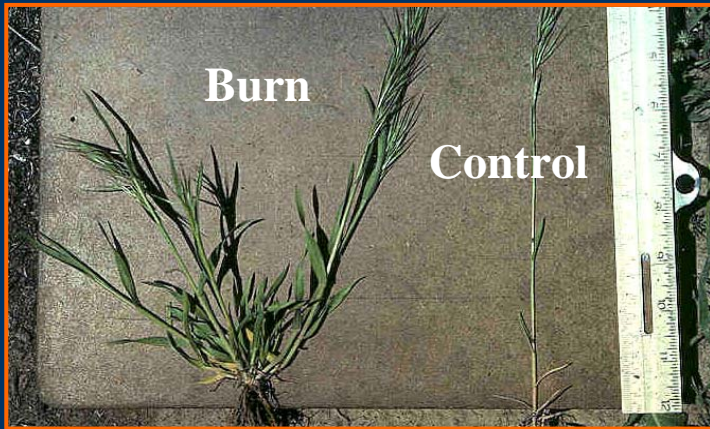
Means followed by different letters in each column are significantly different at  $P > .05$ .



Figure 2. Propane burn barrel used to ignite cheatgrass on June 27, 1990.



# Response of Cheatgrass Plants One Year Post-Burn



Vigor (seed production)  
of cheatgrass plants  
increased 4X



# Fire in Sagebrush/Cheatgrass

Young and Evans(1978)

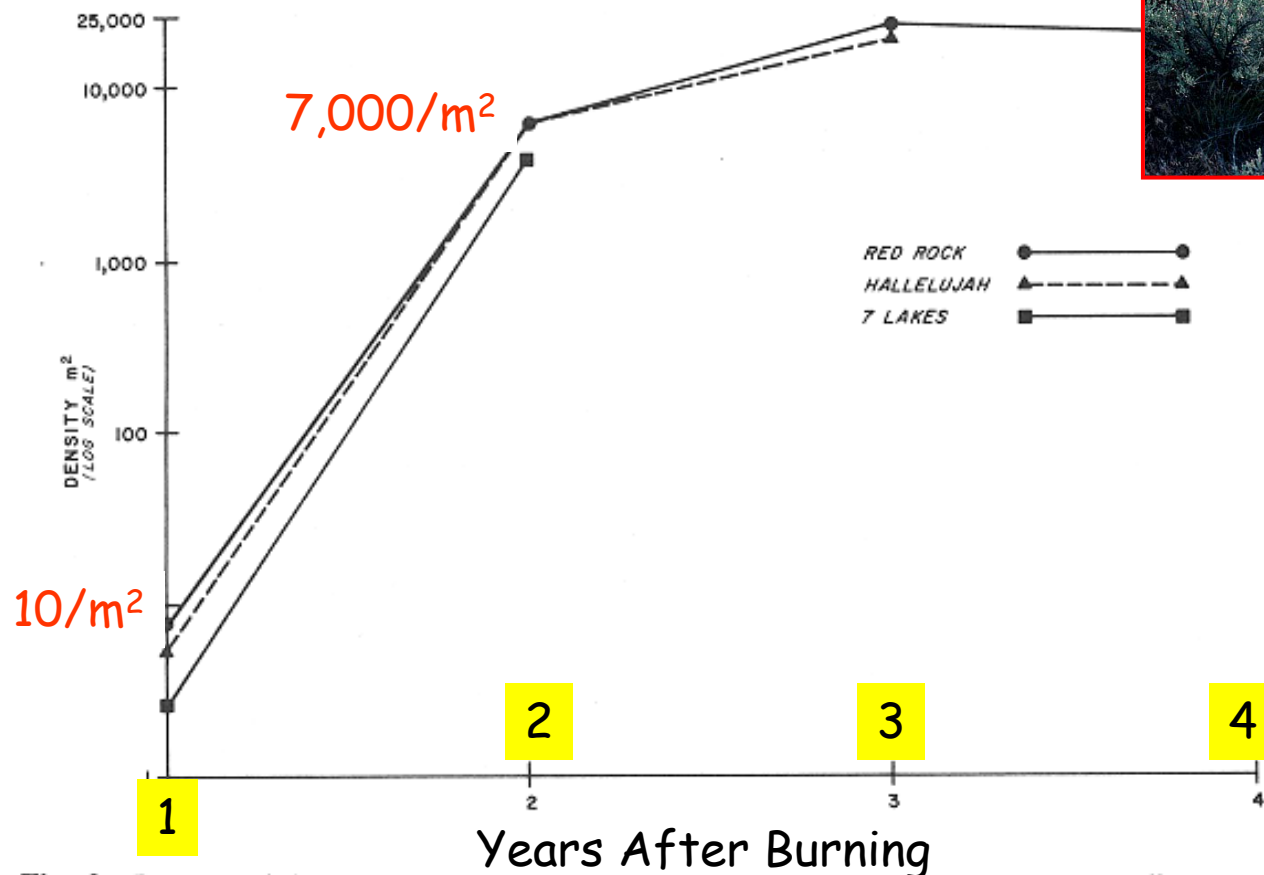


Fig. 2. Density of downy brome plants per m<sup>2</sup> on serotous sagebrush/Thurber needlegrass communities 1 through 4 years after burning in wildfires.



One year  
"window of  
opportunity"  
to reseed—  
sometimes.

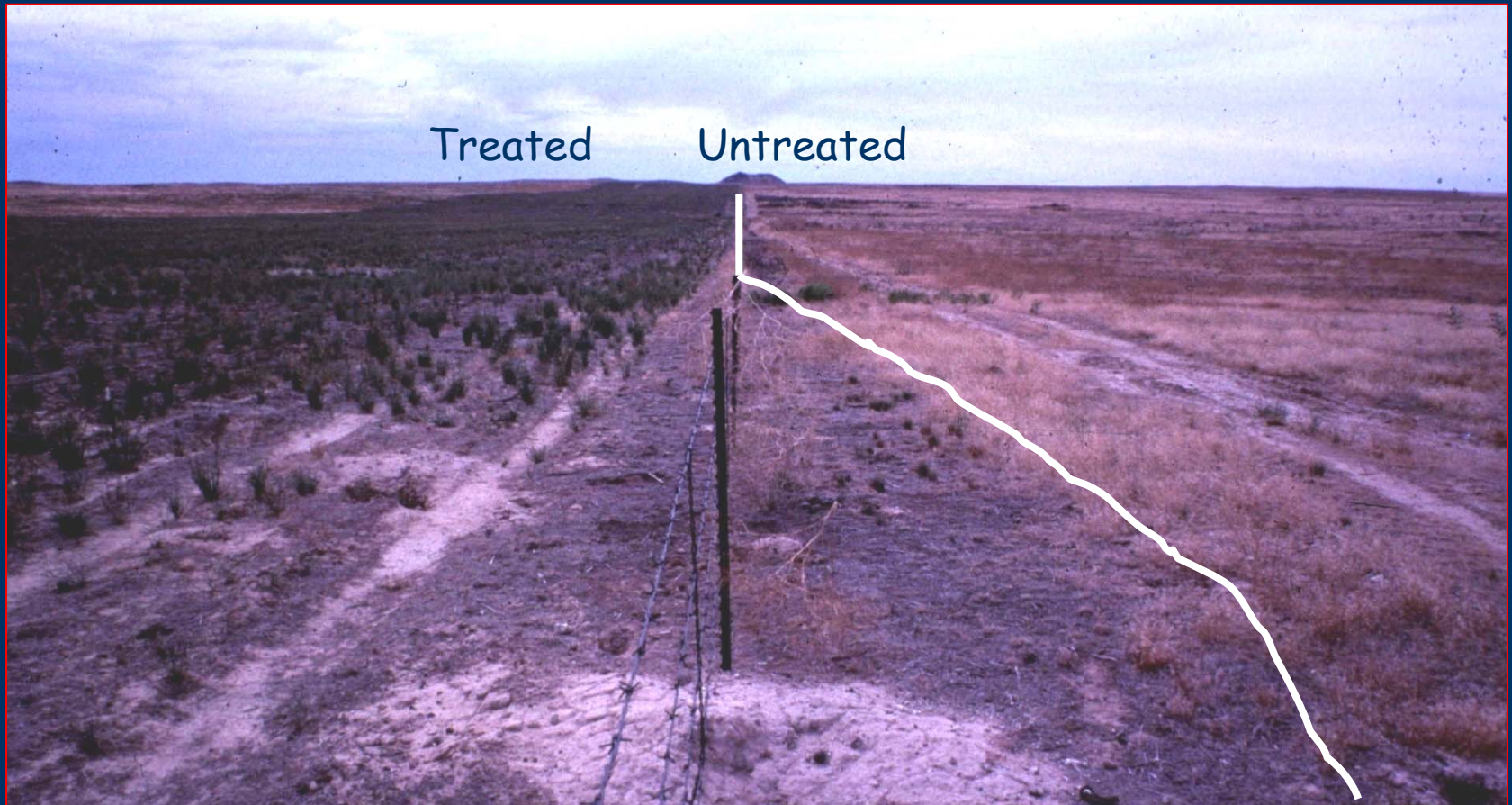


# Herbicide Control of Cheatgrass

- 
- A photograph of a tractor with a large herbicide sprayer tank and long boom, operating in a field of dry, brownish vegetation. The tractor is positioned in the center of the frame, moving away from the viewer. The background shows a flat landscape under a blue sky with scattered white clouds. The overall scene depicts agricultural herbicide application.
- Cost Effective with Risks
  - Requires Special Equipment
  - No Soil Disturbance
  - No Nitrogen Release

# Selective Cheatgrass Control-Herbicides


Reduce cheatgrass and promote perennial plants.





# Herbicides

## Cheatgrass Control Options



**FOR WEED CONTROL, NATIVE GRASS ESTABLISHMENT AND TURF GROWTH SUPPRESSION ON PASTURES, RANGELAND AND NONCROP AREAS**

<b>ACTIVE INGREDIENT:</b>	
Ammonium salt of imazapic (+)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid*	23.6%
<b>INERT INGREDIENTS</b>	76.4%
<b>TOTAL</b>	100.0%

\*Equivalent to 22.2% (+)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid  
(1 gallon contains 2.0 pounds of active ingredient as the free acid)

U.S. Patent No. 4,798,619  
EPA Reg. No. 241-365

**KEEP OUT OF REACH OF CHILDREN  
CAUTION!/PRECAUCION!**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)


In case of an emergency endangering life or property involving this product, call day or night, 800-832-HELP.

See Next Page for Additional Precautionary Statements

® Registered Trademark of BASF

1/02

BASF Corporation  
26 Davis Drive  
Research Triangle Park, NC 27709



Imazapic

Follow the Label

This sample label is current as of 5/27/96. The product descriptions and recommendations provided in this sample label are for background information only. Always refer to the label on the product before using Monsanto or any other agricultural product.

21183V2-1/00



**Complete Directions for Use**

EPA Reg. No. 524-512

**HERBICIDE FOR ROUNDUP READY® CROPS.** Selective, broad-spectrum weed control in Roundup Ready crops. Non-selective, broad-spectrum weed control for many cropping systems, farmsteads, and Conservation Reserve Program acres.

**AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED WOODY ROOTS OR FRUIT OF CROPS (EXCEPT AS SPECIFIED FOR INDIVIDUAL ROUNDUP READY CROPS), DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION MAY RESULT.**

Roundup UltraMAX, Transorb, Monsanto and the Vine symbol are trademarks and Roundup Ready is a registered trademark of Monsanto Company.

2000-1

Read the entire label before using this product. Use only according to label instructions.

It is a violation of Federal law to use this product in any manner inconsistent with its labeling.

Read the "LIMIT OF WARRANTY AND LIABILITY" statement at the end of the label before buying or using. If terms are not acceptable, return of money required.

THIS IS AN ENCLOSED PRODUCT. MONSANTO DOES NOT INTEND AND HAS NOT REQUESTED IT FOR REFORMULATION. SEE INDIVIDUAL CONTAINER LABEL FOR REFORMULATION LIMITATIONS.

**1.0 INGREDIENTS**

**ACTIVE INGREDIENT:**  
Glyphosate, as isopropylammonium salt ..... 50.2%  
OTHER INGREDIENTS ..... 49.8%  
100.0%

\*Contains 800 grams per liter or 5 pounds per U.S. gallon of the active ingredient glyphosate, in the form of its isopropylammonium salt.

This product is protected by U.S. Patent No. 4,803,521 and by U.S. Patent No. 5,103,955. Other patents pending. No claims granted under any non-U.S. patents.

**2.0 IMPORTANT PHONE NUMBERS**

1. FOR PRODUCT INFORMATION OR ASSISTANCE IN USING THIS PRODUCT, CALL 1-800-832-HELP.

2. IN CASE OF AN EMERGENCY INVOLVING THIS PRODUCT, USE FOR MEDICAL ASSISTANCE, CALL COLLECT, DAY OR NIGHT, 24 HOURS 1-800-832-HELP.

**3.0 PRECAUTIONARY STATEMENTS**

**3.1 Hazards to Humans and Domestic Animals**

Keep out of reach of children.

**CAUTION!**

CAUSES MODERATE EYE IRRITATION.

Avoid contact with eyes or clothing.

**FIRST AID IF IN EYES:** Flush with plenty of water. Get medical attention if irritation persists.

**DOMESTIC ANIMALS:** This product is considered to be relatively non-toxic to dogs and other domestic animals. Ingestion of this product or large amounts of freshly sprayed vegetation may result in temporary gastrointestinal irritation (vomiting, diarrhea, etc.). If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

**Personal Protective Equipment (PPE)**

Application and other handlers must wear: long-sleeved shirt and long pants, shoes and socks. Follow manufacturer's instructions for cleaning/maintaining PPE. (Personal Protective Equipment). If no such instructions for washing, use detergent and hot water. Keep and wash PPE separately from other laundry.

When handlers use closed systems, automatic refills, or vacuum in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240) (d) (4-6), the handler PPE requirements may be reduced or modified as specified in the WPS.

**User Safety Recommendations:**

Wash hands:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

**3.2 Environmental Hazards**

This herbicide is highly toxic to water, to which surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.

**3.3 Physical or Chemical Hazards**

Some solvents of this product should be stored, stored and applied using only plastic steel containers.

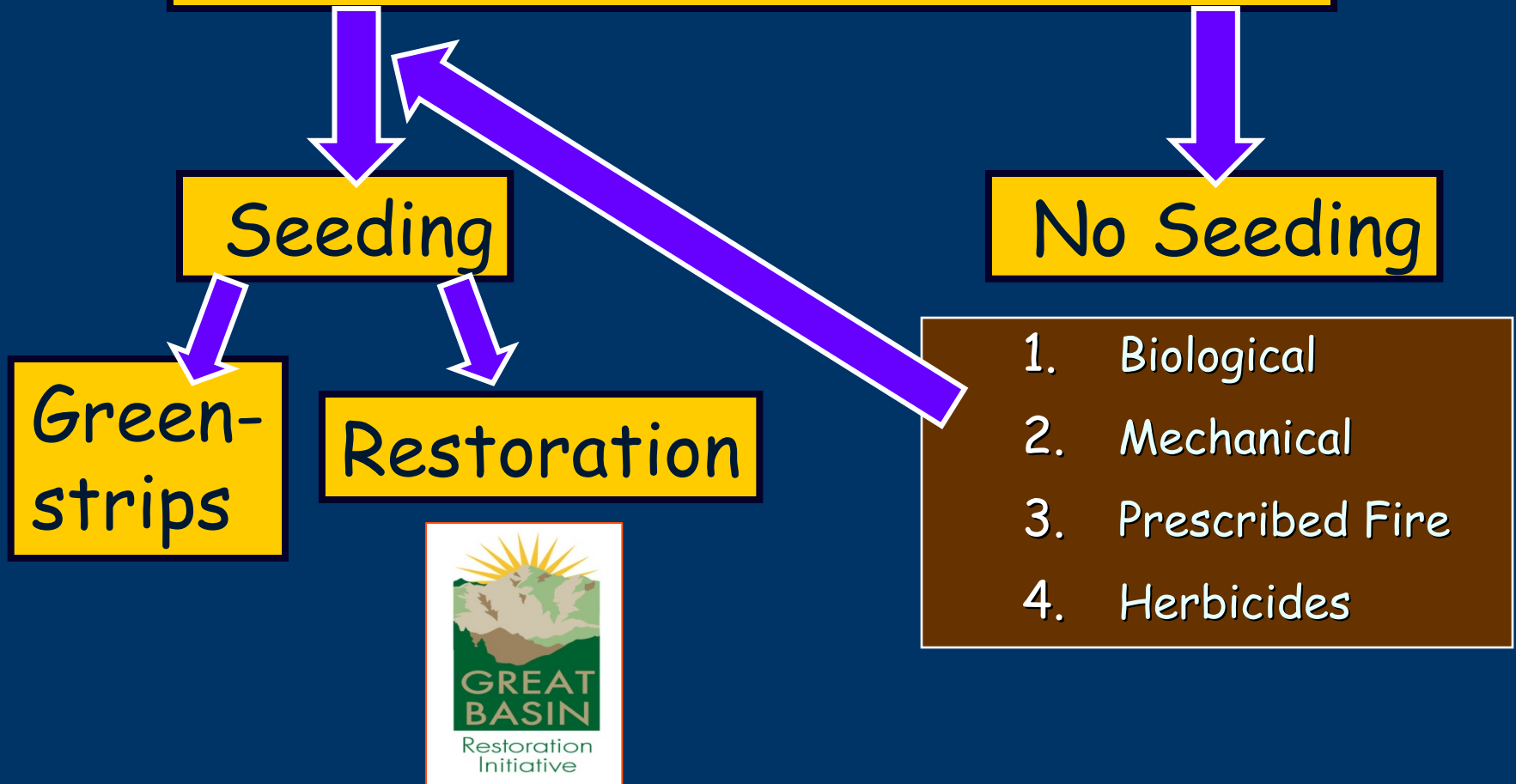
DO NOT MIX, STORE OR APPLY THIS PRODUCT OR OTHER SOLUTIONS OF THIS PRODUCT IN GALVANIZED STEEL OR UNLINED STEEL (EXCEPT STAINLESS STEEL CONTAINERS OR SPRAY TANKS). This product or water solutions of this product react with such materials and cause the production of hydrogen gas which may form a highly combustible gas mixture. This gas mixture could catch fire or explode, causing personal injury. If ignited by open flame, spark, welder's torch, lighter, cigarette or other ignition source.

**DIRECTIONS FOR USE**

It is a violation of Federal law to use this product in any manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only certified handlers may be in the area during application. For any requirements specific to your State or for the control the agency responsible for pesticide regulations.

Glyphosate

# Cheatgrass Control Strategies





# Biological Control

## Cheatgrass Control Followed by Seeding

UNIVERSITY OF IDAHO  
AGRICULTURAL EXPERIMENT STATION  
*Department of Agronomy*

### **Grasses and Cultural Methods for Reseeding Adandoned Farm Lands in Southern Idaho**

R. H. STARK, J. L. TOEVS, AND A. L. HAFENRICHTER



Well established  
that cheatgrass  
must be controlled  
prior to  
implementing  
revegetation that  
can biologically  
control cheatgrass.

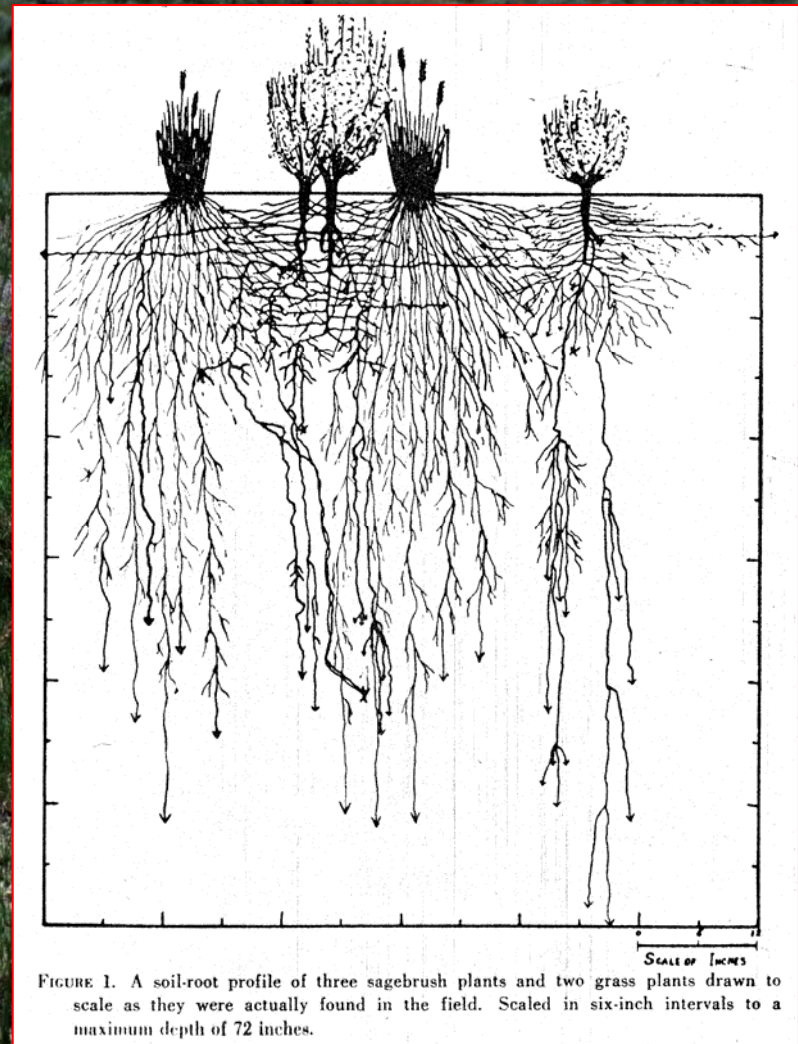
# Monitor Effectiveness of Weed Control Treatment(s) Before Seeding

- Were target species adequately reduced to allow establishment of seeded native species?
- Monitor and use this information to make a seed or no seed decision.
- Options:
  - Retreat and seed later.
  - Do a better job (multiple treatments) during initial treatment.
  - Don't seed expensive natives just because the funds are available.



# Select Adapted (Competitive) Native and/or Introduced Species

Include a suite of seeded species structurally and phenologically different than the invasives to provide continuous competition throughout the growing season.



# Consider Your Seeding Options

- Introduced species only
- Few native species, mostly introduced species
- “Even” mix of native and introduced species
- Representative native species lifeforms (few native grasses and forbs and a native shrub)
- Fully functioning native plant community with all or most species

LOWER

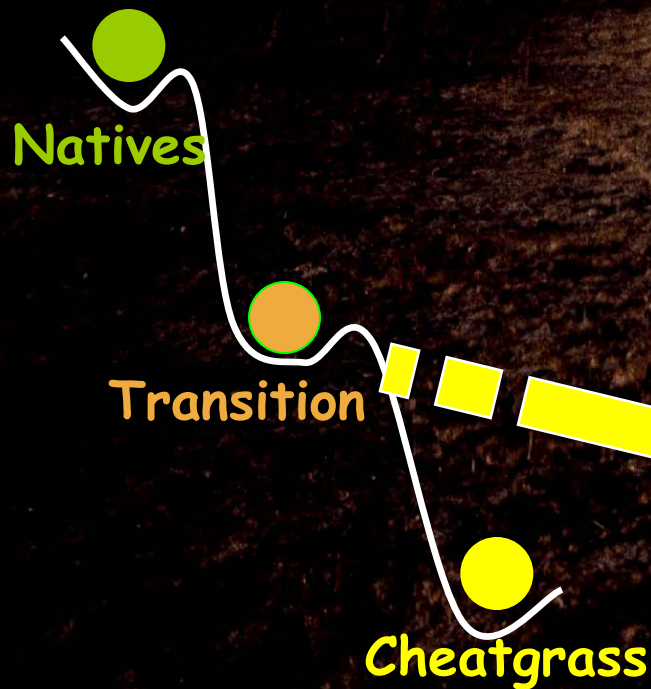
Cost and Potential for Failure

HIGHER



# "Integrating Weed Control and Restoration for Great Basin Rangelands"

## Assisted Succession Model



USDA funded research:

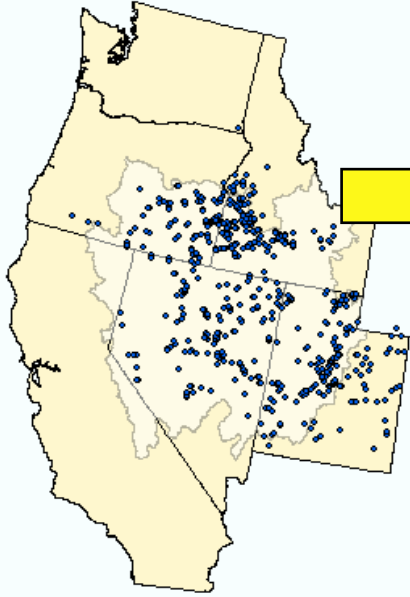
- Three universities
- Five federal agencies
- 16 replicated sites in 4 states
- Three selections of competitive bluebunch WG (equal to Agcr) identified



Bluebunch wheatgrass

# Great Basin Native Plant Selection & Increase Project

## Seed Collection



500+ seed collection sites

## Evaluation/Selection



## Private Production



## Results



## Application



Funding of \$6+ million provided by BLM's Native Plant Initiative



# Revegetation Equipment Catalog

Contents

Home

Forward

Tractors

All-terrain vehicles

GPS

Controlling plants  
mechanically

Controlling plants  
chemically

Controlling plants by fire

Site preparation

Fertilization and  
mulching

Seeding

Specialized planters

Contact us



Produced in cooperation with:  
Rangeland Technology & Equipment Council  
USDA Forest Service  
USDI Bureau of Land Management

On the web at “<http://Reveg-catalog.tamu.edu>”

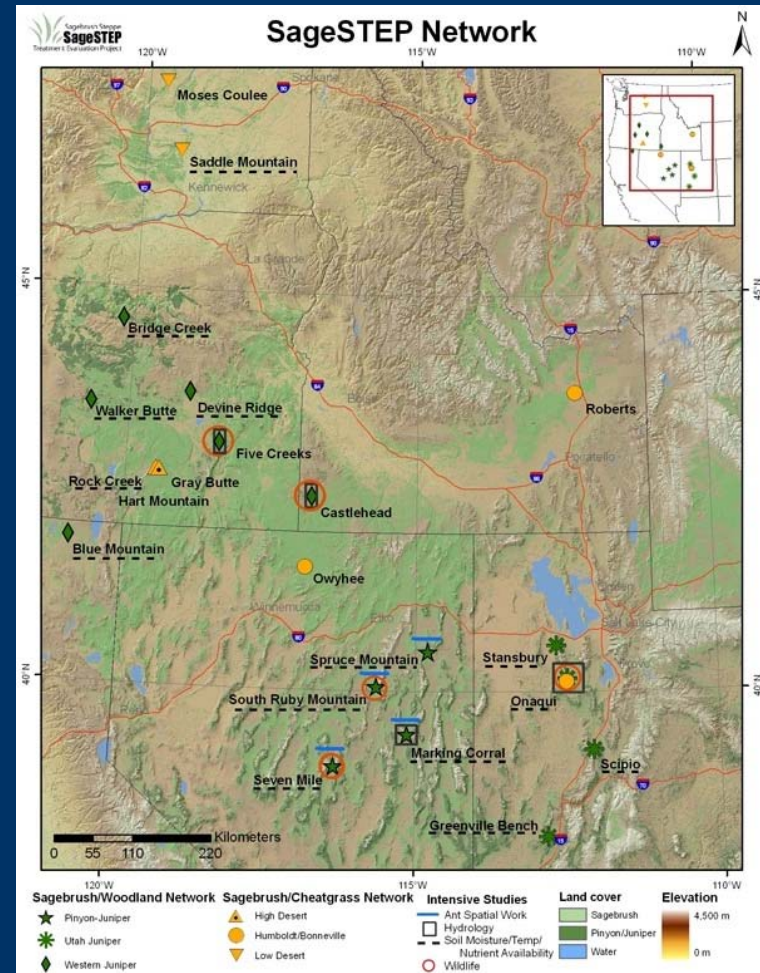


# SageSTEP-Fire/Fire Surrogates in the Sagebrush Biome



**SageSTEP Research Team**

<http://www.sagestep.org>





# ARS Area-Wide Project

## Ecologically-Based Invasive Plant Management of Annual Grasses



Boise Foothills



Looking to the future.....



# Climate Change- Increased Temperature

Expanding cheatgrass invasions into previously cold-limited environments (Keeley and McGinnis 2007) and sagebrush "migration" to the northern portion of the Great Basin (Neilson 2006)....many social, economic, legal, and ecological implications.



# Climate Change- Increased $\text{CO}_2$

Rising  $\text{CO}_2$  is predicted to increase the success of annual plants such as cheatgrass (Smith et al. 1987) and increase lignin (less digestible) content in cheatgrass (Ziska et al. 2005) ...**more fires!**

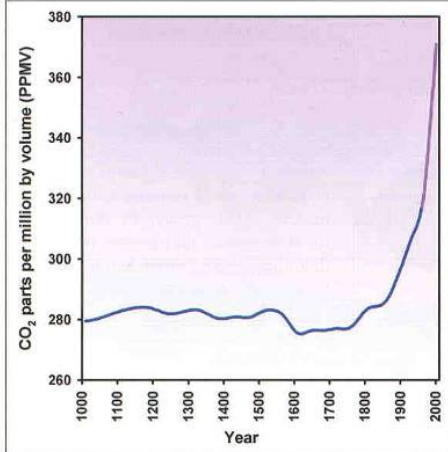
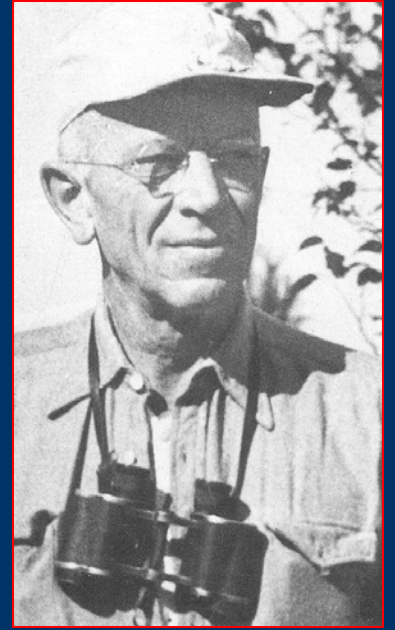


Figure 2. Levels of global atmospheric  $\text{CO}_2$  for the last 1000 years, derived from measurement of  $\text{CO}_2$  in air bubbles in layers of ice extracted from a core drilled in Antarctica (blue line: Etheridge et al. 1998) and from atmospheric measurements at Mauna Loa, Hawaii, since 1958 (purple line: Keeling and Whorf 2002).





*"I listened carefully for clues whether the West has accepted cheat as a necessary evil, to be lived with until kingdom come, or whether it regards cheat as a challenge to rectify its past errors in land-use. I found the hopeless attitude almost universal."*



Essay on "cheat" by Aldo Leopold 1949



“Healthy Great Basin landscapes and sustainable resources that meet the needs of the public that use and enjoy these lands”

